Headquarters U.S. Air Force

Integrity - Service - Excellence

Section 6
Natural Attenuation as the Approved Remedy for England Site SS-45

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Project Team

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Site Description

- Site SS-45 England AFB, LA
- Source is TCE Disposal in Sewer and Storm Drains Creating Multiple Dispersed Leaks
- TCE and Breakdown Products at 0.5 - 1 ppm
- 245-Acre Plume at Depths of 15 - 80 feet bgs
- Sandy Aquifer with Very Low Gradients

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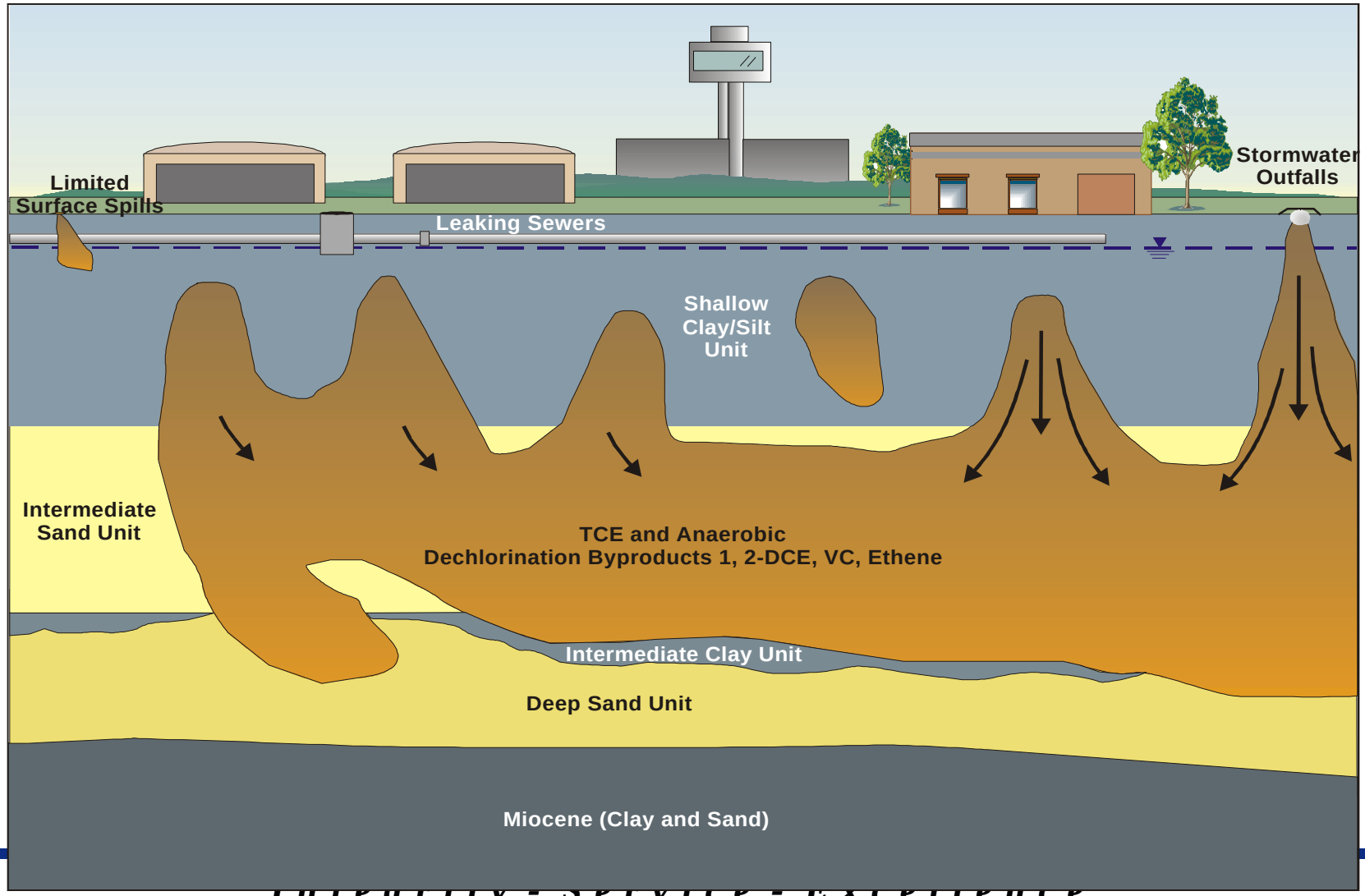
Conceptual Site Model -- Site SS-45



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Project Objectives

- **Evaluate Natural Attenuation as a Potential Remedy**
- **Complete a Corrective Measures Study Evaluating Natural Attenuation and Pumping Alternatives**
- **Gain Regulatory Approval for Selected Remedy**
- **Define Framework for an Operating Properly and Successfully (OPS) Demonstration**

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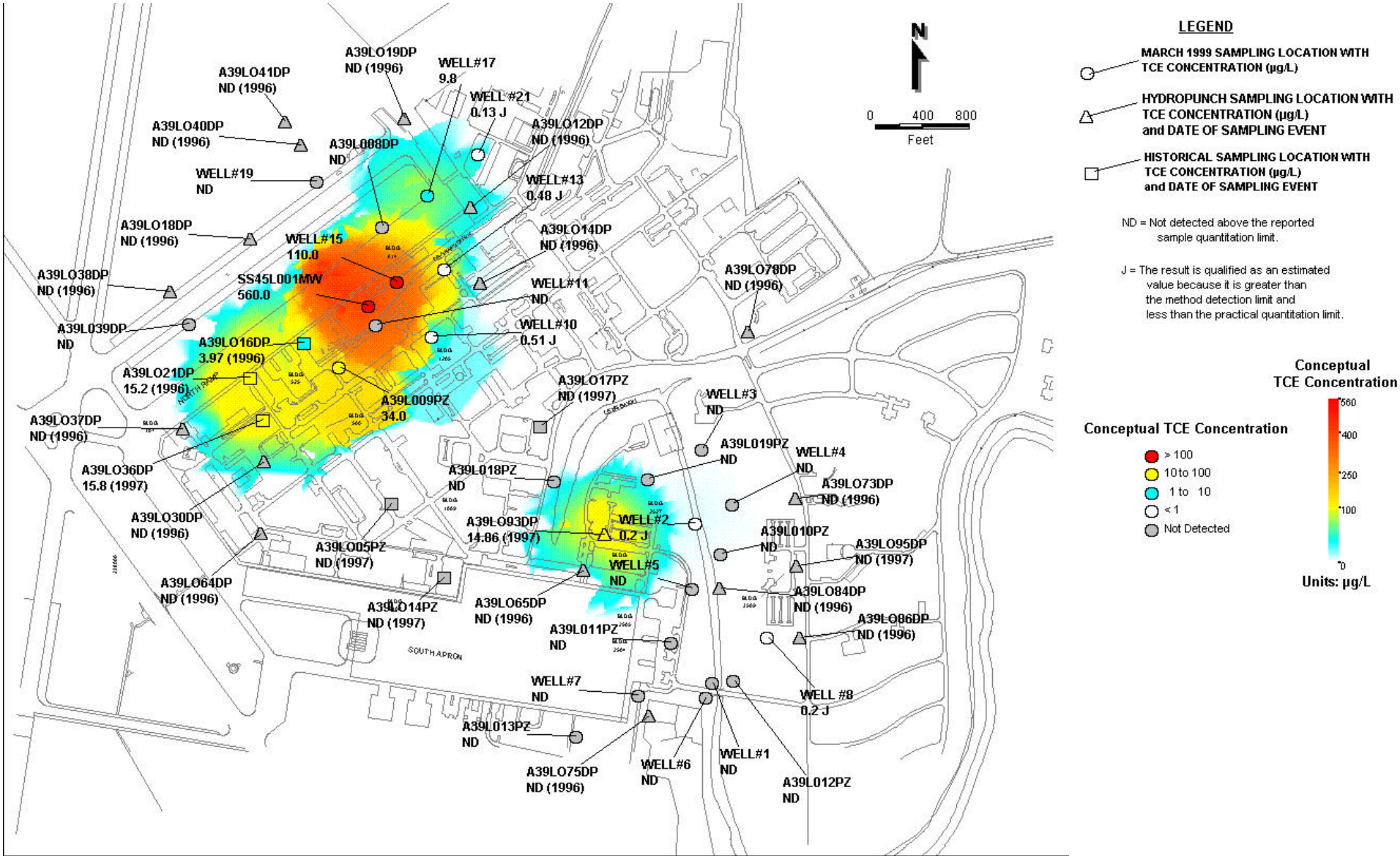
Define Limits of Contamination

- **Priority on 3-D Plume Definition - Not Source Identification**
- **Borehole Flowmeter Testing to Explore Vertical Flow Profiles**
- **Installed 18 New Perimeter Wells and 5 Wells for Vertical Control**
- **Over 40 Wells Required to Bound the 245-Acre Plume**

Distribution of TCE in Intermediate Sand Unit Groundwater



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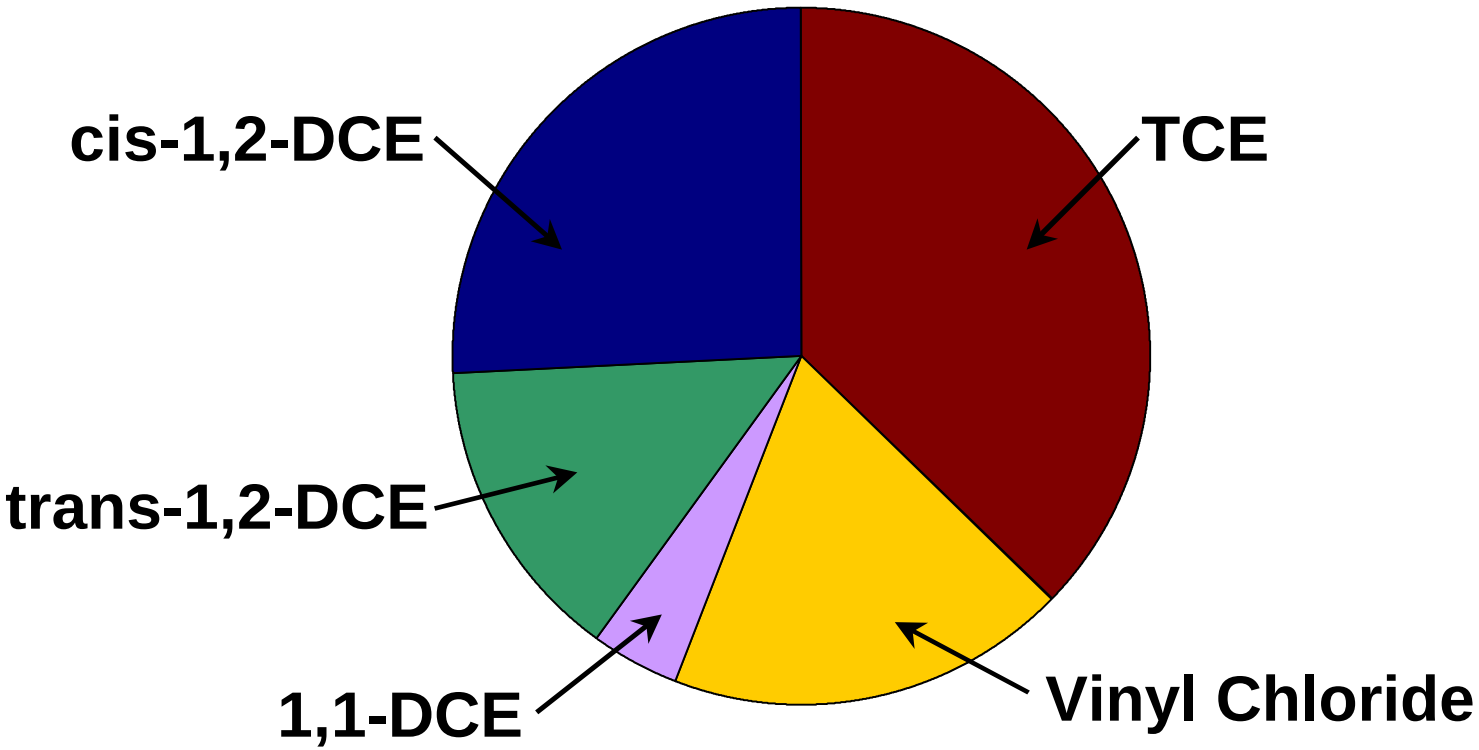
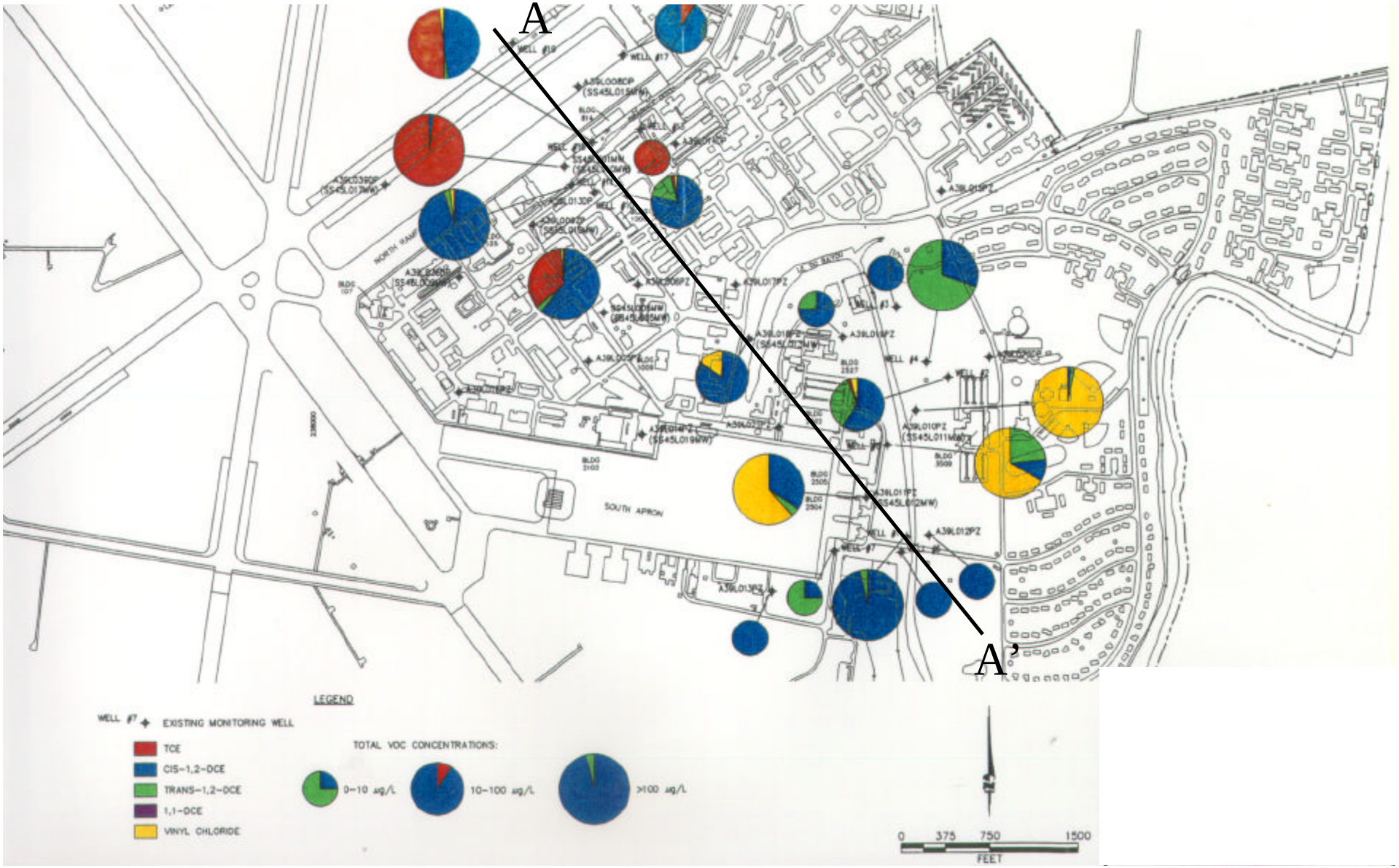
Concentrations of CAH in Groundwater (Legend)



Concentrations of Total CAH in Intermediate Sand Unit Groundwater



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Conditions Favoring Reductive Dehalogenation

- **Reducing Conditions**
  - ORP ranges from - 10 to - 130 mV
- **Low Dissolved Oxygen Concentrations**
  - DO generally < 0.5 mg/L
- **Organic Carbon Substrate**
  - TOC in soil from 0.1 to 0.6 wt percent
- **Available Electron Acceptors**
  - Fe^{++} and Mn^{++} up to 5 mg/L

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Natural Attenuation Evaluation

- **Highly Organic (Swamp) Deposits Have Created Natural Reducing Conditions**
- **TCE → DCE → Vinyl Chloride → Ethene**
- **Lack of Advective Flow Required Innovative Rate Estimation Techniques**
- **TCE and DCE Half-Lives Estimated at 5 Years, VC at 3 Years**

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Corrective Measures Study

- **Evaluate Protectiveness, Implementability, and Cost of Each Remedy**
- **Natural Attenuation Was Baseline For All Remedial Alternatives**
- **Potential Benefits of Pumping for Containment vs Pumping for Mass Removal Were Also Evaluated**

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Protectiveness

- **All Alternatives Will Required Groundwater Use Controls**
- **Natural Attenuation Will Degrade Contaminants in Subsurface**
- **Pumping Will Require Surface Treatment and Release to Air**
- **Natural Attenuation Is Equally or More Protective of Human Health**

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Implementability

- **Natural Attenuation Will Require ~48 Years of Institutional Controls and Monitoring**
- **Pumping Will Require ~26-35 Years of Institutional Controls, Treatment O&M, and Groundwater Monitoring**
- **Tailing Effect of Desorbtion Could Extend Pumping Timeframes**

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Costs in 1999 Dollars

- **Natural Attenuation Alone - $1.5M**
- **Natural Attenuation + Pumping - $15M+**
- **Inflation Will Widen the Cost Differential**

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CMS Recommendations

- **Natural Attenuation Alone Is Protective And The Most Cost Effective Remedy**
- **Due to Site Unknowns, The Progress Of Natural Attenuation Must Be Verified**
- **A Long-Term Monitoring And Verification Plan Is The Centerpiece Of This Remedy**

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Regulatory Approval

- The monitored natural attenuation remedy was approved by LDEQ and Region 6 EPA in December of 1999.
- This was one of the first MNA approvals in EPA history without extensive source removal requirements attached.
- Key to approval was negotiation of a 5-year monitoring and verification procedure.

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Long-Term Monitoring and Verification Plan

- Plume Stability Must Be Verified Annually Using Sentry Wells
- Groundwater Use Controls Must Be Enforced and Verifiable
- After Five Years, Compare Estimated Degradation Rates To Actual Reductions
- OPS Demonstration Approval If Plume Contained and Rates Are Acceptable

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Summary

- **LDEQ and EPA Region 6 Have Approved CMS and Long-Term Monitoring and Verification Plan (December 1999)**
- **Estimated Cost Avoidance - $15M+**
- **OPS Determination In 2004 Based on Verification of Plume Stability and Natural Attenuation Timeframes and Costs**

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One Less Of These to Maintain for 40 years!!

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Thank You